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BY

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WHAT THE COAL MINER CAN DO TO PREVENT INJURY FROM FALLS OF ROOF[1]

By. J. W. Paul[2]

The coal miner works mostly by himself or in company with another miner or helper; consequently, he is virtually alone during most of the shift of about 8 hours. Where it is optional whether a miner work alone or with another person, he should always work with another, since the judgment of two is better than one in determining the safety of the roof.

The interruptions to the miner's work are chiefly those which occur when his loaded car is being removed and an empty car placed for his use, and when the section boss, mine foreman, fire boss, or shot firer visits his working place. There are, however, relatively few working places in a mine where the supervisory officials spend over five minutes in an 8-hour shift, on an average.

The miner receives pay for the amount of coal he loads into the mine car, so it is to his interest to load as much as possible with minimum interference from having to perform other prescribed duties which may be included in the rate for loading coal, such as preparing and setting up props, taking down loose or dangerous roof material at or near the face, either loading the roof material into cars or stowing it in his working place, and laying track to keep it close to the coal face. The taking down of loose or broken roof material, the rejection of impurities in the coal, the quantity of roof material such as draw slate that he is required to handle, all take up a part of his time during which he is not loading coal; this labor, unproductive of coal tonnage on his part, is commonly called "dead work." In some mines, as in mechanized mining, where dead work is done by special men employed for the purpose, the miner is paid less for loading the coal than when he also does the dead work, so in either case his earning power is not changed materially. Some coal mines have a system in which the miner becomes merely a loader of coal and other men are employed to do the timbering; particularly is this the practice where loading machines and conveyors are used. The loader, therefore, should follow the suggestions herein made for the miner in so far as they relate to testing the roof and keeping from under loose or dangerous roof.

The laws of most mining States require that the working places of the mines shall be made safe; that no employee shall be required to work in an unsafe place unless it is for the purpose of making the place safe; that when the place can not be made safe, the workman shall be withdrawn from the place, or the workman shall on his own initiative withdraw from the place.

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[1] The Bureau of Mines will welcome reprinting of this article, provided that the following footnote acknowledgment is used: "Reprinted from U. S. Bureau of Mines Information Circular 6315.

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It may be inferred from the foregoing that the intent of the laws is to protect the miner from injury or death.

Experience in the conduct of underground workings develops the mind of some workman to formulate judgment as to what may constitute certain classes of danger, and it is from this type of employee, logically, that the supervising officials should be selected.

HOW TO DETERMINE THE SAFETY OF A ROOF; RECOMMENDED PRACTICE

The judgment of an official and miner is relied upon to determine whether the roof of a coal mine is safe. Means of testing mine roofs and some of the precautionary measures necessary to insure the safety of working places are as follows:

1. Upon looking at roof material in place, it may be determined if there are cracks, if some part is partly detached from overlying material, or if a broken prop is supporting loose material. Such observations will be apparent even to the inexperienced person as indicating the liability of the material to fall. However, only the most dangerous roof is detected by sight, and usually the danger is so pronounced that only the most venturesome will pass under it; consequently only a minimum get caught under such roof. The every-day roof exposure can not be judged as to its danger by merely looking at it, so other means must be employed.

2. Roof material that has every appearance of being sound and safe may be most dangerous, and this is the class of roof that usually takes the toll of the miners' lives; therefore, it is a part of the duty of the miner to take all precautions to determine the soundness and safety of the roof under which he works.

3. The miner should make a study of the roof material to determine if it has cracks or slip planes in it; he should note the general direction of these and when setting props the cap piece should be placed across the crack or slip plane.

4. The miner should provide himself with an iron bar about 3 feet long and of 1/2 to 5/8 inch diameter for use in testing the roof. If the roof is more than 8 feet high, he should have two bars of sufficient length to enable him to reach the roof.

5. Upon arriving at his working place, the miner should make a test of the roof, and at regular intervals of not over one hour he should make additional tests of the roof, as well as whenever any one visits his working place. The person testing roof material that appears loose or unsound should not stand immediately under it.

6. In making a test of the roof, the miner should use the vibration method, which requires the placing of the bare fingers of one hand against the roof while striking it with the testing bar in the other hand. Where the roof is more than 8 feet high, the second bar should be held against the roof with the bare hand. The vibrations felt in the fingers against the roof or in the hand holding the bar will indicate the relative soundness of the roof if the piece is thin or relatively small. Large pieces of loose roof often do not give vibrations when

struck, and this causes the miner to assume that the roof is safe. If he risks working under it, safety props should be used as a temporary support for his protection.

7. The miner should be on the lookout for any chalk marks, such as a cross or circle, on the roof, since the fire boss, foreman, or section boss often thus indicate loose or dangerous roof which should be taken down, or a place where a prop should be placed; where a chalk mark is observed the miner should take prompt action either to remove the material or securely timber it.

8. The miner should discuss with his section boss or foreman all roof problems and get advice on how to detect unsound or unsafe roof.

9. The miner should comply with the systematic method of timbering where such a system has been adopted, and exercise his judgment in placing additional posts or timbers for his own protection.

10. Where there has been no system of timbering adopted by the operator, the miner is placed at a disadvantage; in this case he should ask the mine foreman for instructions as to the best method of timbering to cope with the nature of the roof. At many mines there are no printed rules or diagrams posted as guides for timbering, although the operator has a system which is explained to the miner by the foreman or his assistant and the miner is presumed to follow such verbal instructions.

11. The miner should notify the foreman in advance of his need of props, caps, and wedges to insure always having at hand all necessary timber.

12. The miner should provide himself with a slate bar, an ax, saw, adjustable post measuring stick, and sledge as essentials in taking care of his roof. All of these tools should be kept in safe workable condition and stored in a safe place.

13. In setting props a cap piece should always be used, placed between the roof and the prop. The size of the cap piece is of much importance and should never be less than 3 to 4 inches thick, as wide as the top of the post, and at least 18 inches long. Where longer caps are used, their thickness should be at least the diameter of the top of the post.

14. A wedge used to tighten a post should be driven between the post and the cap piece, and the wedge or wedges should be as wide as the top of the post. Where coal is liable to fall off the face or rib and roll against the post, it is an advantage to place the wedge with its smaller end pointing toward the coal face or rib. In very high coal (over 20 feet) it is considered good practice to drive the wedge under the foot of the post, in which event the cap piece should be securely nailed to the top of the prop before it is erected.

15. In pillar work where the roof is beginning to sink, the weight will bend and break props, especially those that do not have good cap pieces. Such props should not be used again except for other purposes, as for lagging or cap pieces.

16. When props are to be withdrawn for the purpose of bringing about a fall along the pillar or break line, the use of substantial cap pieces on the props when first erected will render them much easier to withdraw. In most cases the props may be used again for roof support.

17. In taking out props to cause a fall of the roof, a mechanical post-puller should always be used. Knocking out the props with an ax or sledge is dangerous and has resulted in the death of many experienced miners and face bosses.

18. Where the coal is weak at the face or has irregular or pronounced slip planes, sprags or leaners should always be used to prevent the coal from falling away and rolling onto the miner.

19. Safety posts with wedges should be used in most mines while the miner is loading coal. The post should be set to give the miner protection and not add to his danger.

20. When working under draw slate, the miner should always set enough props to hold the roof secure; he should not work under unsupported draw slate.

21. An endeavor should be made to keep the entry or room to the width prescribed to conform to a systematic method of timbering.

22. The miner should take pride in placing timber correctly, for some day it is probable, when there is a real campaign to prevent accidents from falls of roof, that the officials may offer prizes for the better-timbered places.

23. The greatest danger to the miner is from falls of the roof; for this reason he should keep his mind on the roof and not neglect the timbering. During 1929, 1,178 persons were killed by falls of roof in coal mines in the United States about 58 per cent of all fatal accidents; 74 per cent of these fatalities resulted from falls at the face.

24. The miner should cease work and leave the place when the roof becomes so dangerous that his method of timbering does not make the roof safe.